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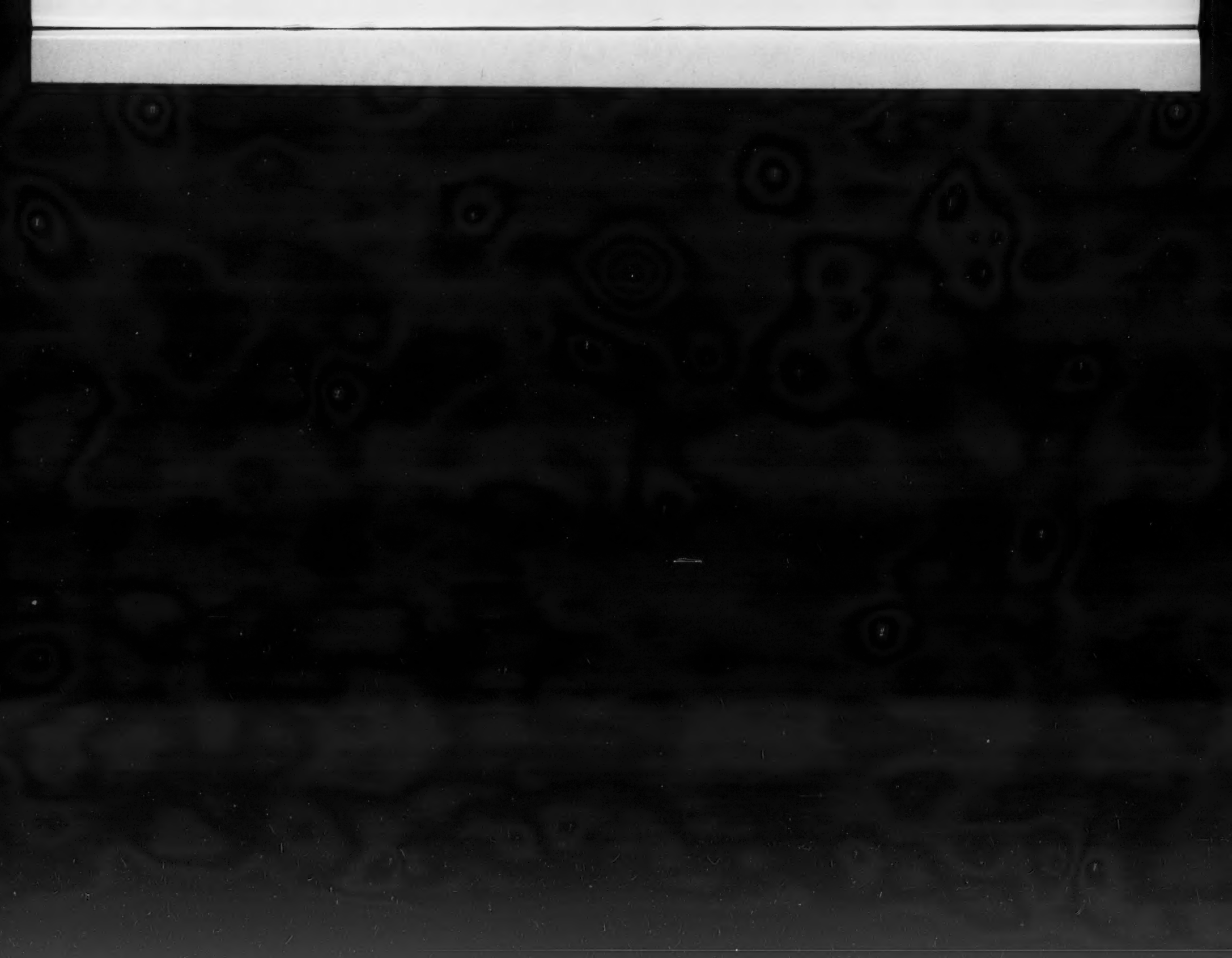

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TUCSON'S ORNAMENTAL LIGHTING SYSTEM

At Tucson, Arizona, a series street lighting system has recently been installed throughout the business section of the city. Two styles of standards are in service, there being 75 one-light and an equal number of five-light ornamental standards spaced at 120 ft. intervals so as to illuminate 9000 street feet. The one-light standards are staggered and parallel, the five-light placed opposite one another and parallel.

Illumination of Congress Street.

The current supply from the substation is controlled by two 75 k.v.a. and one 12 k.v.a. Westinghouse constant current regulator. The lights are fed from a No. 8 lead-covered cable carried in fiber conduit embedded in concrete.

The standards are 13 ft. 6 in. high, fastened by bolts to a concrete base. Each five-light post has a four-light arm 12 ft. from the curb and carrying four 60 c.p. type C 6.6 amperes, 2300 volt series Mazda lamps and fitted with 12 by 6 in. Nuglass globes. The top light of these posts and the one light posts each carry one 100 c.p. similar lamps, fitted with 16 by 8 in. globes.

The installation cost for five-light standards was $143.23 per standard, itemized as follows:

Conduit, wire and terminals	60.0 per cent
Standards	26.2 per cent
Lamps and glassware	7.7 per cent
Labor and incidentals	6.1 per cent

The installation cost of one light standards was $101.76 per standard, which cost may be proportioned as follows:

Conduit, wire and terminals	61.3 per cent
Standards	28.4 per cent
Lamps and glassware	3.6 per cent
Labor and incidentals	6.7 per cent

These costs do not include the transformer station and current regulators, this portion of the installation costing $2389.25.

The maitnenance expense is estimated as follows:

Lamp renewals, 5-light standards	$4.12 per post yearly
Lamp renewals, 1-light standards	2.00 per post yearly
Globe renewals	No estimate
Painting and miscellaneous	No estimate

The current cost for operating lights will be 5c per kw.-hr. The top lamps of the five-light posts and the lamps on the one-light posts burn every and all

Five-Light Standard.

One-Light Standard.

night. The other four lights on the five-light posts burn every night from dusk to 10:30 p. m. These lights are turned on and off by patrolmen at transformer station. This ornamental system is proving highly satisfactory in every respect. Merchants are remodeling their windows to keep pace with the lighting improvements, more people are out in the evening and fewer patrolmen are needed. The city officials have been so highly gratified that they are already preparing specifications for doubling the present system, which was installed under the supervision of John Whitestone, city electrical engineer, from designs and material supplied by the Russell Electric & Machine Company of Tucson.

SEATTLE MUNICIPAL DAM BLUNDER.

The city of Seattle on November 1, 1914, completed a concrete dam which was to be used to impound water for regulating the flow of Cedar River. The total cost of the structure up to April 1, 1915, had been in excess of $1,700,000. Primarily, this water was to be used for generating power at the municipal hydroelectric plant.

About 1¼ miles above the present dam is the old Cedar Lake timber crib dam constructed a number of years ago, from which water was conducted to the present hydroelectric plant.

With the new dam, the head under which the plant was to operate was 585 ft. The minimum flow of Cedar River is 148 sec. ft. which was in October, 1902, and August, 1903. The estimated storage behind the new dam is approximately 150,000 acre ft., which would allow of a sustained flow in the stream of approximately 389 sec. ft. The maximum power, therefore, that could be developed with this storage would be approximately 19,000 continuous h.p. The new dam has a top length of 795 ft. with a maximum height of 217 ft.

Up to May, 1912, the preliminary work consisted of clearing the site and preparing the foundations, which was done by day labor under the supervision of the city engineer and board of public works, although no complete and thorough examination of the dam site had ever been made, nor had any even partially-complete engineering plans of any description been prepared, nor had any borings been made or test pits sunk along the north bank, which is a gravel plateau or moraine, very pervious to water; yet approximately $700,000 had been expended on this preliminary work. It was at this time that the Emerson efficiency experts employed by the city severely criticized the extravagant methods employed and the protests from various commercial bodies and the taxpayers over the manner in which the work was being conducted resulted in a decision to call for bids for the completion of the dam and let the contract for finishing the work.

Earlier geological examinations of the moraine on the north bank developed the fact that it probably occupied the site of the old Cedar River Channel which originally emptied into the Snoqualmie River, the next drainage north.

Under such circumstances, it would have seemed particularly desirable and highly important to determine the depth of bed rock and whether water would escape through the moraine.

Owing to the protests already made and the continued protests of citizens, the city council in May, 1912, decided to employ a board of three consulting engineers, at heavy expense, to make an examination of the site and submit recommendations on a number of questions connected with it, one of which was—whether there was any danger of seepage through the north or right bank of the river. This bank rises sharply from the river bed to a general elevation of 1600, being approximately 150 ft. in height at the present dam site. The general elevation of this morainal plateau extends northerly approximately one and one-half miles to the Snoqualmie River drainage, thence drops rapidly to that river at an elevation of approximately 600 ft. in 1½ miles. This moraine is formed of

sand and gravel of a highly porous character. No tests were made as to the rate of ground water movements by this board, due to lack of time, and no test pits or borings had been made previously. It was necessary, therefore, for them to approximate the amount of loss which would be had, but it was stated that they believed it entirely possible that the seepage losses might be greater than their estimate of from 50,000 to 65,000 acre ft. per annum. They further stated "We regard the matter of such vital importance, in any event, that in our opinion, no work should be done in the way of actual dam construction until this problem has been satisfactorily solved by actual tests, and by actual tests, we mean the putting down of a series of test wells to determine the position of the ground water plane between the proposed dam site and Snoqualmie River, actual measurements of the movements of ground water between these test wells and numerous mechanical analyses of the materials derived at different depths in said wells."

Geologists and engineers from the staff of the University of Washington had made investigations and their reports were to the same effect.

It had been stated by the municipal authorities that the exposed right bank of the river would seal up, under a plan of raising the water surface by slow successive annual stages. The board of engineers said, "We would say that in our opinion no such result may be reasonably expected under the conditions which prevail here" and this was supported by arguments which should have been conclusive.

In closing their report they recommended that a series of well drill holes be put down, and that further diamond drill borings be made immediately upstream and downstream from the dam site, and closed by recommending strongly that all construction operations in connection with the building of the dam at the proposed site be suspended until such time as a thorough investigation of the possibilities suggested in their report could be demonstrated and the best plan to pursue be decided upon.

Notwithstanding the recommendations made by this board of engineers and the estimated loss of from 50,000 to 65,000 acre ft. of water per annum, the Board of Public Works of Seattle, in a letter to the mayor dated May 10, 1912, disposed of this all important question by stating that since the board of engineers believed that the loss would only amount to from 50,000 to 65,000 acre ft. per annum and that this loss would not imperil the dam or any of its appurtenances or render them in any way less efficient, and that since in a smaller way the experience of the city in building the original timber crib dam showed that the seepage at first encountered was gradually done away with, and that since every reservoir has more or less seepage at first, it was their belief that the north bank would seal itself, perhaps not entirely but practically so, and that they believed the construction of the dam at the proposed site was justified. Mayor Geo. F. Cotterill, in transmitting this letter to the council, under date of May 11, 1912, stated "there is nothing in this seepage problem which necessarily suggests change of dam location" and insisted that there should be no delay in pushing construction. One member of the board of public works submitted a minority report recommending that the suggestions made by the board of engineers, be followed out, but no attention was paid to this report by the council; the work was ordered done and contract let for the dam.

The dam was completed late in 1914. The north end of it is approximately 25 ft. above the surface of the surrounding country. In order to reach the same elevation as the crest of the dam, it is necessary to go at approximately right angles to it a distance of about one-half mile to reach high ground upstream, which is a part of the gravel plateau. The intention was to construct an earth bank or dam on top of this plateau to an elevation corresponding with the top of the dam, and it was thought quite probable that it might be necessary to put in a concrete core wall—this, however, without having made any soundings in this plateau to determine the depth to which such core wall would need to go. Upon the completion of the dam, Nov. 1, 1914, and the backing up of water in the reservoir, numerous springs and streams developed at points down stream both in the Cedar River and Snoqualmie watersheds, indicating a heavy loss of water, so great in fact that it was believed impossible and dangerous to raise the water to even the temporary spillway elevation, which was some 45 ft. below the crest of the dam. The water leaked out rapidly, in fact the outflow was greater than the inflow. Investigations were immediately begun by the city as to the possibility of silting. No clay being available in that vicinity (and it is not believed there is any within miles of the dam site) it was decided to sluice in the top layer of soil from the area immediately above the dam site in an endeavor to stop the leaks. The top layer of soil consists of humus, sand and some loam, the latter being very light and forming a small percentage of the layer. After some time and money had been spent in this endeavor, it became questionable in the minds of city officials whether such a procedure can be followed satisfactorily. Various estimates have been made as to the cost of doing this work, and while it is acknowledged that it is in the nature of an experiment, these estimates range from $250,000 to $1,000,000 and upwards. Competent engineers acquainted with the situation do not believe it is possible to seal under the conditions here existing. More recent investigations have developed the fact that the water when allowed to back up still escapes as rapidly as before, and in some instances a greater flow is had in the new streams. It is now proposed to build either a concrete core wall or practically a new dam across this moraine. Soundings have now been made in this morain to a depth of 300 ft. without encountering bed rock. If such is the case, any engineer can readily appreciate the impracticability of attempting to construct a concrete wall in a hole of this depth. Further it can be readily realized what the cost of a wall under such conditions would be.

The city engineer has recommended that a commission of engineers of national reputation be appointed to thoroughly investigate and report upon the situation—that test holes be driven to determine foundations, if any exist, for curtain wall. He further states that at least 400 acres of the sides and bottom of the basin will have to be silted and that in his opinion this would be a doubtful experiment while entailing

an enormous expense. Councilman Erickson stated in the council chambers that the voters would turn down a bond issue for a curtain wall which would cost at least $1,500,000 and he was opposed to making such a request of the taxpayers because municipal ownership would get a black eye in Seattle.

Needless to say, with a board composed of members who were on it when the mistake was made, no stone will be left unturned to attempt to utilize the present dam. Had they taken the advice of men competent to give it, the present situation would not have been had. Ordinary business prudence would have suggested that caution be used in proceeding with a work of such magnitude before definite knowledge was had relating to the bank in question, but due to the fact that there was an insane desire on the part of city officials to increase the capacity of their power plant, no reasonable recommendations would be recognized by them since they did not want any further delay.

As the situation stands today, the city of Seattle has expended $2,959,454 for their municipal hydroelectric plant, transmission lines and the city substation, and with a total investment in plant on January 1, 1915, of $6,225,867, are able to generate only 10,400 kw., and this can be obtained only about nine months in the year, it being necessary to supplement if this amount is obtained with steam auxiliary plant. This makes a total cost for a water power plant of $285 per kw. If $1,000,000 will seal the reservoir, and $1,100,000 additional is required for the hydraulic and electrical work and transmission lines, the total construction cost of the water power plant would amount to $5,000,000 and with 19,000 h.p. available, the cost would be $357 per kw. or $268 per horsepower.

Press reports state that the city officials are considering the abandonment of this dam, with the large amount of money invested in it, and the acquisition of a power site on another stream to supplement the city's supply of power.

Electric Light Plant for Lucban.—Lucban, Tayabas Province, Philippine Islands, is to install a hydroelectric plant to supply light and power to the municipality. The proposed plant will cost $30,000. The machinery will be purchased from American importers and the plant will be ready for operation in August. The project will be financed by Filipino capital through a corporation floated in the municipality. The power for the plant will be generated by the water of the Pagsipi River, which flows through the municipality. The electric light and power system will consist of a Pelton water turbine, connected to a General Electric alternator, a concrete dam across the river, a headgate, flume penstock, a complete power plant, transmission and distributing line. The system will require 42,000 feet of wiring and 1,600 feet of flume line, with a capacity of 900 liters a second. Construction will begin at once. Lucban is one of the centers of the Philippine hat industry. One of the incentives for constructing the new lighting and power system was the great need for better lighting in the homes where the hat industry is being conducted.

ELECTRICAL FIRES.

BY F. D. WEBER.

Electrical fires do occur nowadays, but fires of other origins are often called electrical—"cross wires" being a very convenient expression. The great difficulty in finding proof of an electrical fire, lies in the fact that the evidence is the first thing destroyed.

Nevertheless statistics show that the proportion of electrical fires at the present day is low in comparison with other sources. The reason for this low fire record is the fact that early in the life of the industry, precautions were taken to make its use safe and reduce the life and fire hazard. A National Electrical Code was written by a National Committee with rules which had only one object in view and that was safety from fire.

This code has been amended and expanded from time to time up to the present date. The general acceptance of this code by the various electrical interests and inspection departments throughout the United States has also tended to establish safe construction throughout the country as a whole.

Municipal departments, seldom write a less rigid code for their own use but generally take it as a minimum and formulate their rules so as to be more exacting. So far so good, but this does not tell the whole story and we would not have any electrical fires to speak of at all, if it did. Because electrical installation work looks so simple mechanically and is so attractive, there is hardly a person who does not think at some period in his life that he would not like to try to do a little himself. Consequently we get meddling by "Tom, Dick and Harry," which can not be regulated by any municipal or underwriters' department.

Also we have the prevalent feeling among owners that because the installation has been in service 20 years and they have had no trouble that they can't see why anything should be done to change or maintain it. If the suggestion is made by an inspection department they immediately accuse them of being interested in selling electrical material or are getting a commission for all the work they can get for some electrical contractor. Still they would not argue that a shingled roof on their place of business did not have to be replaced or repaired because it did not leak for a term of years.

Furthermore, the science has been and is still progressing so rapidly that many systems of wiring are called upon to take on loads which were never dreamed of when it was installed and they consequently fail and cause trouble many times just for this reason. The great numbers of portable heating, cooking and lighting devices are a prolific source of trouble.

Electrical fires have their origin in fundamental causes, as, follows:

1. Heating of the conductor fittings or apparatus.
2. Arcing between two conductors.
3. Arcing between the ends of the same conductor.
4. Arcing between the conductors of a circuit and some other material which may be in contact with the circuit conductors or grounded.
5. Introduction of stray currents on systems not designed for same, as lighting or power on signal sys-

tems, transformers burning out and allowing primary current on secondary systems.

6. Lightning during storms.

The writer thinks that if the following notice was posted conspicuously in every electric light cabinet, that it might call to the attention of property owners the danger of allowing incompetent persons to make extensions and do electrical installation work. It reads as follows:

Caution.

Don't allow employes or inexperienced persons to tamper with or make alterations in or additions to the electric wiring or equipment. Any necessary changes should be made by an experienced electrician and be examined by a duly authorized inspector before placed in service.

Don't use the ordinary drop cord for portable work. If lamps are to be carried about use cord having a reinforced insulation.

Don't allow incandescent lamp globes to be placed in contact with combustible material. Every portable lamp should be covered with a substantial wire guard. Care should be taken to keep inflammable materials displayed in show windows or cases from coming in contact with lamp globes.

Don't attach paper or cloth decorations to drop cords or lamps.

Don't place anything in contact with wires or fittings. They should be carefully protected from mechanical injury.

A defective electrical equipment is hazardous to both life and property.

Electric lighting and power is less hazardous than any other system known when installed and maintained in strict accordance with the National Electrical Code.

A simple electrical inspection may be made by a layman if the following schedule is followed, it being thoroughly understood that the report would be only superficial and would not be a thorough electrical inspection but at the same time would eliminate some of the most dangerous conditions in a great many instances if conscientiously carried out.

1. In general, it should be remembered that in all electrical work, conductors, however well insulated should always be treated as bare, to the end that under no conditions existing or likely to exist, can a ground or a short circuit occur, and so that by leakage from conductor to conductor or between conductor and ground may be reduced to a minimum.

In knob and tube work insulation of the wire is never depended upon as an insulator but some other material is used in addition to same.

In conduit work and metal moulding work, the insulated wire is placed inside of a definitely grounded casing. This protects the wire from mechanical injury and if trouble does occur, it will occur inside of the metal sheath and at the same time become definitely grounded and blow the nearest fuse in the circuit, relieving the dangerous condition and doubtless no fire would result unless the trouble would be of a very extensive nature or outside of the grounded sheath.

Service wires must, where they enter buildings, be supported on brackets and insulators being generally dead ended on same and have a drip loop on the wires, to prevent moisture from entering the porcelain tubes through which they pass into the building in knob and tube installations.

In conduit installations the outer end should be properly equipped with a condulet which should be preferably turned downward. The iron conduit should extend continuously into an iron service cabinet if same is used, or if the cabinet is not used should extend to the service cutout, and be equipped with approved fittings.

Wires on the front of buildings should be protected from contact with cornices, awnings and signs.

Service cutouts should be provided with approved fuses, service placed directly inside the building. The service should be brought to a point suitable for safe and convenient location of the fuses. If same are subject to mechanical injury, or located where the operation of the same would be apt to start a fire, they should be enclosed inside of a cabinet.

Fuses should all be enclosed type except those on a switchboard.

Service switch of approved form should be provided as near as possible to where the service enters the building and be within easy reach from the floor so arranged that the entire equipment, including meter, can be disconnected when necessary. The switch should be protected by service fuses.

Branch fuses should be provided for each 660 watts of energy equivalent to sixteen 40 watt lamps. They should be located in a readily accessible position and generally should be assembled in groups and if installed near inflammable material subject to mechanical injury, installed inside of approved cabinets constructed of iron when conduit or metal moulding is used, and wood may be used asbestos lined, if knob and tube work is installed.

The branch circuit fuses are the devices upon which the wiring and fittings composing the lamp circuits depend for safety in case of accident. They are the safety valves.

Wires used for concealed wiring must be rubber covered—that is, when run in wooden or metal moulding, concealed in floors, partitions, walls or run in iron conduit. Slow burning wire may be used when entirely exposed on the surface inside the building where no moisture exists. Weatherproof wire must never be installed inside of a building.

Exposed wires for ordinary work should be mounted on porcelain cleats or knobs which keep the wires at least ½ in. from the surface wired over and 2½ in. apart.

Supports to be used at least every 4½ ft. on ceilings of ordinary height and one-half this distance on lower ceilings, walls or partitions.

Joints.—Joints in all classes of wiring should be thoroughly soldered and be put together by a secure mechanical method, also there should be rubber and friction tape in all joints in rubber covered wire. With slow burning wire, friction tape alone may be used. Protection to open wiring and suitable mechanical protection should be provided for all wires running on side walls, ceilings, under shelving, etc. There should be a substantial boxing and wooden moulding guard strips or preferably metal conduit.

Flexible cords must not be run on walls, ceilings or through partitions in place of standard wires and are not approved in show windows. Cord is only

designed for use as a pendant and should not hang lower than 5 ft. from the floor. In most cases flexible cord drops of unnecessary length should be avoided as much as possible and should be kept clear of wood, pipe, nails, etc. Where portable lights are required cord especially designed for this service should be used. If portable lamps are used, they should be surrounded by a substantial wire guard. Pendant cords should not be decorated with paper shades, tissue paper, etc.

Motor troubles are due mainly to too small wires being run to the motors or too large fuses on the circuits and starting boxes fastened to woodwork which become heated or may burn up in case of trouble and communicate a fire to surrounding objects.

Direct current motors are equipped with a commutator and brushes which should be operated in such a way as to avoid serious sparking when in proximity to readily inflammable material. In order to decide the proper size of wire for motor installations, it is necessary to get the current rating of the motor from the name plate.

For direct current motors the wire should be at least of sufficient size to carry 25 per cent more than this rating and for alternating current motors approximately 50 per cent.

Sockets should be equipped with wire guards where they would come in contact with stock or inflammable materials. Inlet bushings must be provided to avoid the braiding of the pendant cord. Key sockets should not be used where there is a great deal of flying dust.

Vapor proof sockets should be used where there are inflammable materials.

Porcelain sockets should be used where there is likelihood of the person operating same becoming grounded.

Heater units should be provided with a separate circuit from the cabinet box. The habit of attaching heating apparatus to existing circuits causes a great deal of trouble, as they are generally inadequate for the service and carry the added burden at considerable hazard and reduced efficiency.

Mechanical work should receive special attention. It is often the case that poor material well put up is safer than the very best approved devices installed in a careless and slip-shod manner.

"Fibrox" is a new heat insulating material which has been developed in the laboratories of the General Electric Company as a fibrous form of silicon oxycarbide. It is made as a soft resilient material, weighing less than 3 grams per liter, because of from 99.5 to 99.9 air in the pores.

Daylight wireless messages between Arlington, Va., and the new naval radio station at Darien, Panama Canal Zone, were exchanged on April 30th, a distance of 2000 miles. The Poulsen arc system is employed here as well as in the German radio station at Tuckerton, N. J., which is in regular communication with Germany by day as well as by night. The Arlington-Darien stations are the links in a chain of high-powered stations which the navy expects to have in operation between Washington and the Philippines by the end of the year.

APPLICATION OF ELECTRICITY TO GRADE CROSSING DEVICES.

BY J. A. BELL.

[Concluded.]

Before taking up the matter of open circuit control, the system chiefly used by electric roads, it may be of interest to discuss briefly the power employed in driving the signal itself, from the point of view of economy and of reliability. When a lighting circuit is convenient, it is not unusual to find signal engineers availing themselves of it. Such power is cheap and the railroad company is at no expense for maintaining its source of energy. But it has one fatal drawback. The essence of any signal is reliability, and the lighting circuit may be out of commission at any moment. An entire division of one of our great railroad systems in California is equipped with a power line which supplies energy to all signals on that division requiring it. It is quite within the bounds of possibility that this source of energy should be out of order, in which event every signal on the system dependent upon it would be out of commission. A much more reliable, though more expensive source of energy, is the storage battery. Each signal is then a complete unit in itself and a failure in one does not imply a failure in the rest. Furthermore battery driven mechanism are of low voltage and are much less subject to trouble incident to higher voltage mechanism.

The employment of electrically driven signals on electric roads introduces some features that are absent in steam road operation. Naturally the railroad desires to employ its propulsion current in the operation of its signals and this implies special relays and signals designed to operate under the higher voltages required in electric railroad operation. It is almost a universal practice among these roads to use the rails to complete the return circuit to the power house and this feature of their operation greatly complicates the employment of the closed circuit system we have just been considering. Where direct current is used for propulsion a closed circuit through the rails may be established by means of a device known as a reactance bond which permits of the passage of direct current but will not carry alternating current. By the use of this bond an a.c. track circuit can be established in rails that are used for d.c. return and practically the same type of signal control as above described may be maintained. The expense of such installation militates against their use and as a general rule, the electric roads resort to an open circuit independent of the rails. A track instrument, depending for its action upon the depression of the rails under the weight of a train or upon the oscillation of contacts from the vibrations in the rails produced by an approaching train, closes a circuit through a relay which is energized from the main conductor and cuts in power from that conductor to the signal itself. A similar instrument at the crossing reverses the action of the relay and cuts the power out. Another widely used form of control is by means of a contactor attached to the trolley wire, wherein the circuit is closed by the trolley wheel or pantograph roller itself. While convenient and inexpensive the system is by no means as reliable as could be desired. The records of a large electric system, whose maintenance is strictly first class, show that 45

per cent of its signal failures, when this method of control is employed, are due to these contactors.

I have endeavored to outline the simplest form in which electrically operated signals are controlled either by closed or open circuit but the actual exigencies of train operation call for something more than the bald outlines I have presented. For instance, to take the case of the open circuit. Assume that one train within the circuit does not leave it before a following train enters it. It is evident that when the first train passes the crossing it will cut out the signal and leave the crossing unprotected against the following train. Such a contingency is more or less successfully provided against by placing one or more supplementary starting contacts within the circuit at such intervals that the following train cannot reach them before the preceding train has passed the crossing. Or to take the case of single track operation under open circuit. When a train passes a crossing and reaches the starting contact for trains moving in the opposite direction, it will put the signal again into operation, although it is now moving away from the crossing. This is overcome in practice by placing a release contact a few feet beyond the starting contact, so that while the departing train will momentarily energize the signal, it immediately cuts it out again. This difficulty is also met by the use of directional contactors. These are devices which close the circuit when the trolley wheel is moving in one direction but leave it open when moving in the opposite direction.

It is of interest to note that the objection I mentioned above to the use of a lighting circuit to any such source of energy over which the railroad has no control, does not apply to the use of the propulsion current itself in the operation of signals. When an electric road's own power fails its traffic ceases and there is no necessity for a warning signal until the power is cut in again.

Here and there a disposition on the part of the authorities seems to be developing to demand additional warning to that provided by a signal at the crossing itself. This may take the form of lights placed on the highway at a given distance from the crossing which are automatically cut in and out by the same circuit through which the signal itself is controlled. To what extent such supplementary warnings are of value is a debatable question. The mere multiplying of signals is just as apt to lead to confusion as to serve any useful purpose.

The subject of relays employed in connection with signals is a most interesting theme. They are made in a great variety of forms to meet almost any conceivable condition of operation that can arise and constitute in truth the very heart of a signal installation. Broadly speaking they are of two types, plain relays, which open or close a circuit directly, and interlocking relays in which a cycle of two or more functions is necessary before the relay reverts to normal. Mechanical relays are made and are more or less successful in controlling circuits but the term is usually confined to the electric devices. Some of the perplexing problems of highway signaling have been solved by the relay. An instance of this is the slow acting relay which is practically a combined relay and timing element. This becomes valuable when a train stands for any length of time in a signal circuit and it is desirable on account of the vicinity of dwellings not to have too prolonged an operation of the audible element of the signal.

The mechanism of the several types of electrically driven warning signals now in use is quite varied but naturally resolves itself into two main classes, motor driven machines and machines which depend for their action upon magnets or solenoids. One of the first and most ingenious of these devices consisted of the figure of a man holding a flag in his hand. When the energy was cut in, the automaton vigorously waved the flag and by means of a diaphram was made to emit a noise which presumably was intended to represent a warning shout. This was quite an elaborate affair from a mechanical standpoint. It came into the field somewhat ahead of the demand for this class of protection but in any event its very elaborateness would have precluded its use. There was too much about it to get out of order and it would no doubt have frozen up tight in a sleet storm. It is interesting as illustrating one of the first stages in the development of an automatic device that would perform the functions of a human watchman. The inventor could not rid himself of the idea that it was necessary to combine his visible and audible element with the actual human presence so as doubtless to convey the impression of a governing intelligence. There is a psychological suggestion about this that might be worth some academic consideration.

This leads us in conclusion to institute some comparisons between the relative efficiency of human watchmen and automatic warnings. The psychology to which I have just referred would seem at first glance to be on the side of the man with the flag or lantern in his hand and who is capable of personally addressing himself to any individual who may seem inclined to disregard his warning. His actions, too, are not controlled by a more or less complicated system of circuits, relays, batteries and mechanisms. But on the other hand a human being has many limitations and failings. He may get intoxicated, or be overcome by some form of sickness, may go to sleep at his post, or his attention may be diverted from his work at a critical moment or his judgment may be in error as to the speed of an approaching train or he may give the wrong signal. Unless his position at the crossing is elevated above the highway, he may easily be lost to view in a crowded street. The automatic device is free from all of these drawbacks. It is elevated above the roadway, it never makes a mistake in judgment as to the distance at which it should begin its warning, it never gives the wrong signal. It may indeed fail as all things mechanical may fail but as I have pointed out, in the most widely used system of control, viz: the closed circuit, any derangement of the installation other than in the machine itself, causes the signal to go to danger. But to show the perfection to which this art has now attained, it will be sufficient to state that there is in the vicinity of Los Angeles a highway signal of this character electrically operated and controlled by open circuit, which has a record of about 200 000 functions without a failure scored against it, a record of faithful service which I very much doubt the ability of any human being to equal.

INDUSTRIAL USES OF FUEL OIL

BY F. B. DUNN.

Fuel Oil for Naval and Maritime Purposes.

[Concluded.]

The Koerting system is the outcome of a number of experiments conducted by Schutte-Koerting Company of Philadelphia, Pa. Fig. 89 shows a sectional view of boiler fronts with the Koerting system applied to a water tube boiler. C is the air register, fitted with air admission slides to regulate the air that is required around the burner; and B indicates the automatic air doors that regulate the amount of air necessary to complete the combustion of the oil.

The "Dahl" mechanical fuel oil system has been adopted by many of the steamship companies on the Pacific Coast. It was the first mechanical system to successfully operate with the heavy California oils. The burner is extremely simple, having only a few parts, consisting of a tip, atomizer, strainer, tube and valve. The operation of the burners is regulated by the pressure on the oil line, rather than the valve of the burner.

The furnace front as shown in Fig. 90 is of approved construction, so arranged that the burner passed through a pipe, on the end of which is a cone or deflector which can be adjusted by moving it in or out to insure the proper quantity of air just where it is needed. The front is extended so that the whole length of the furnace is utilized, and the brickwork is so fitted that repairs and examinations can be made without removing it. Fig. 91 shows an outline of an installation on a Scotch marine boiler, arrangements of pumps, heaters, etc., being clearly indicated.

Natural and Forced Draft Test for Comparative Evaporation.
(Scotch Marine Boiler Fitted With Oil Burning System.)
Remarks—Data for One Boiler.

One Scotch Marine Boiler.
Three Corrugated Furnaces—38 in. I. D.
Diameter, 13 ft. 10 in. Length, 9 ft. 10 in.
Pressure, 150 lbs. W. P.
Heating Surface, 1658 square ft.
Tubes—250, 3 in. diameter, 6 ft. 9½ in. long.

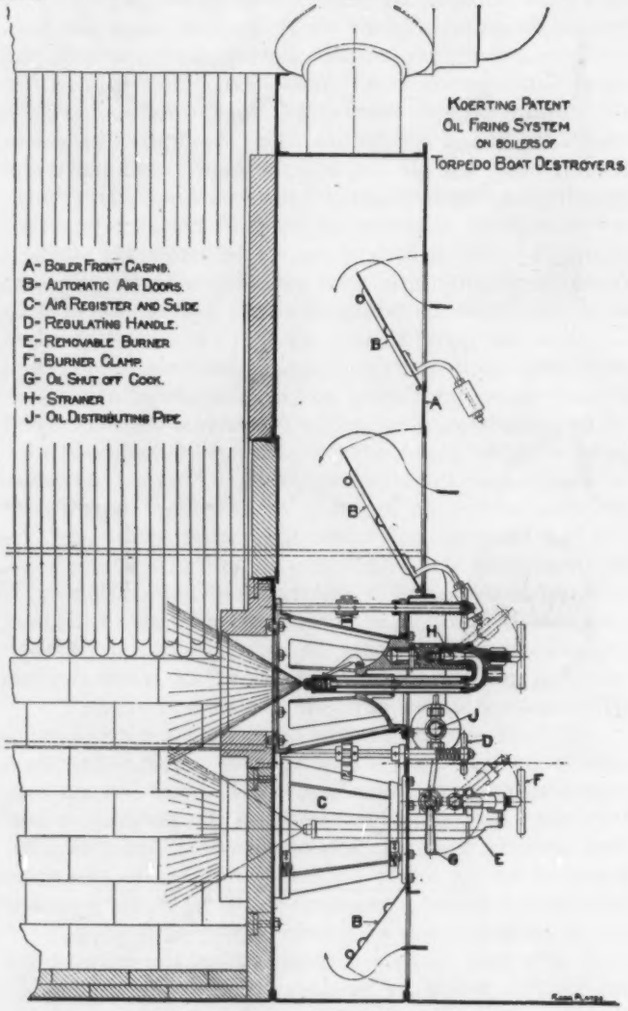


Fig. 89. Koerting Oil Firing System.

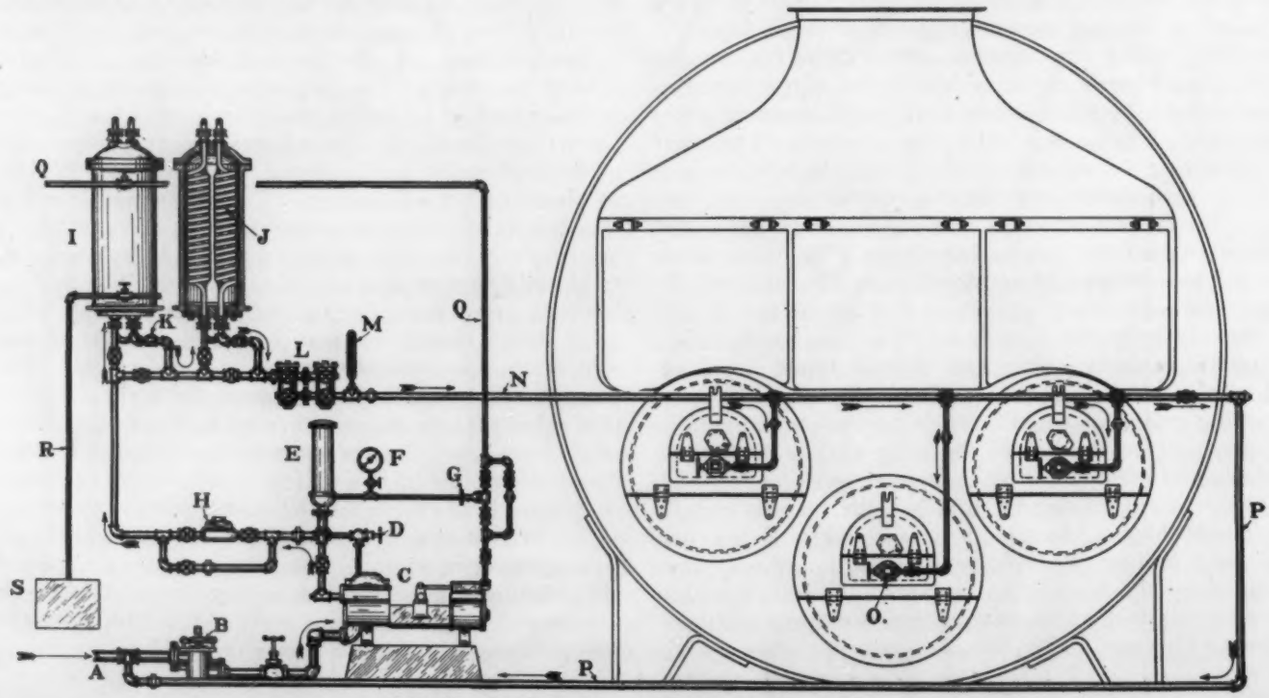


Fig. 91. Dahl System on Scotch Marine Boiler.

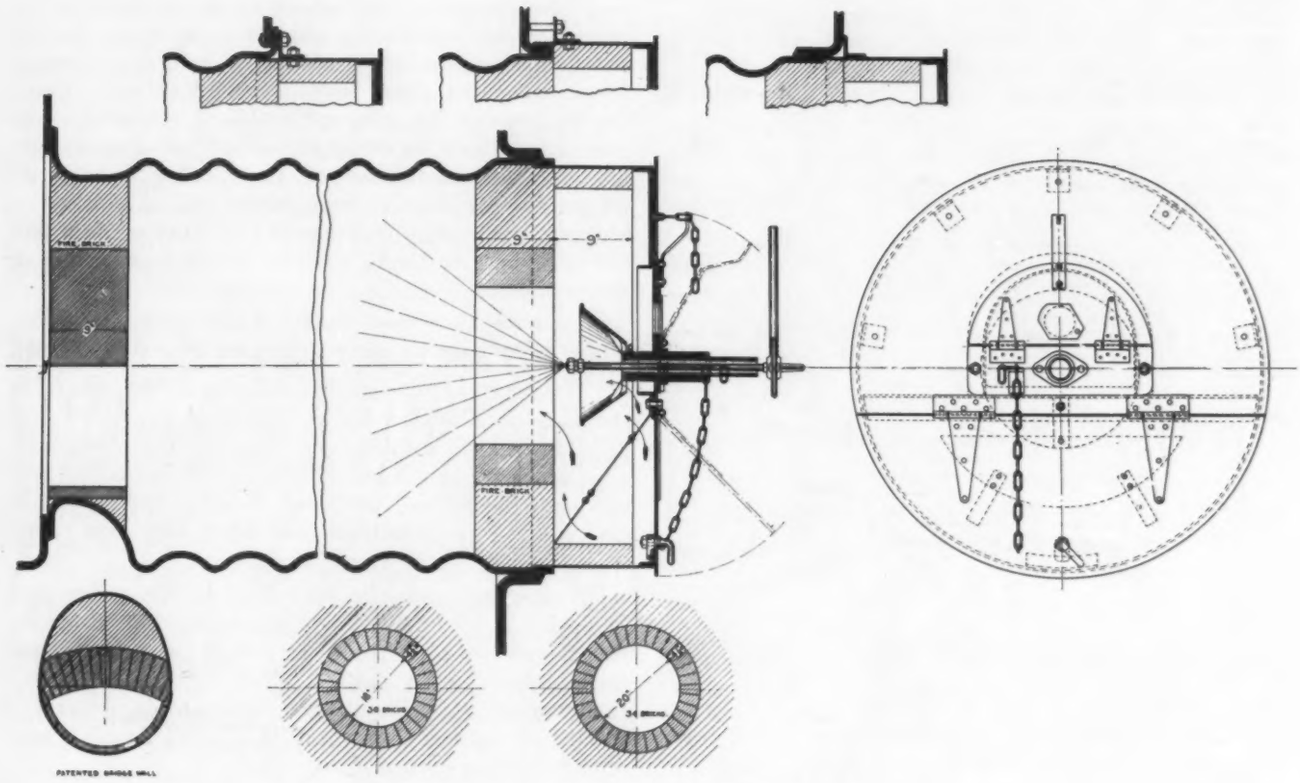


Fig. 90. Furnace Front for Dahl System.

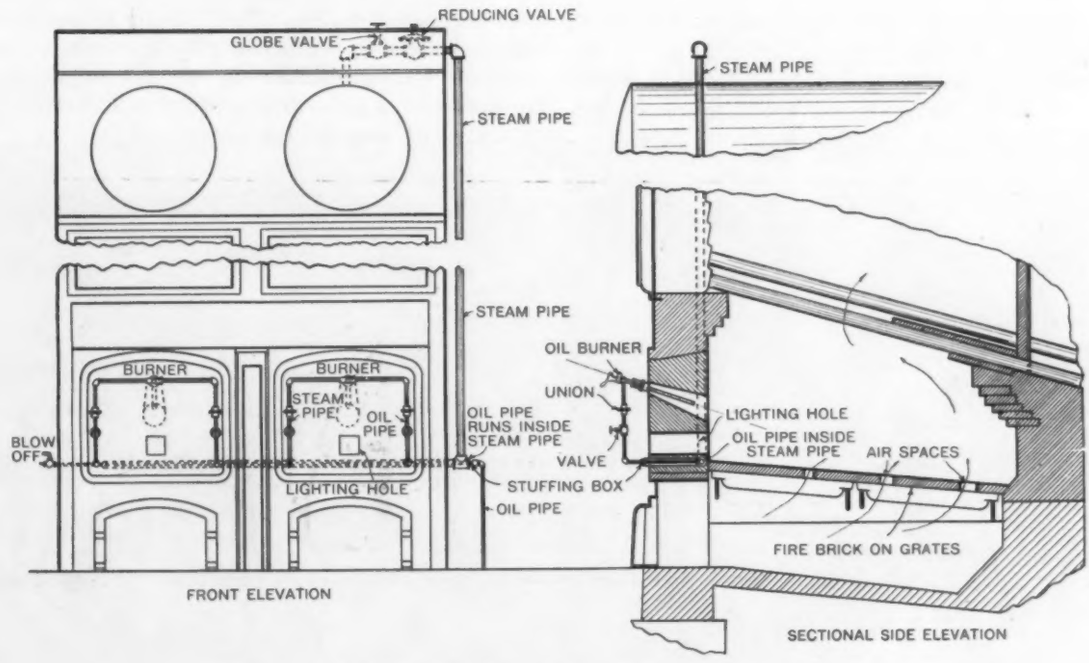


Fig. 92. Tate-Jones Pressure Jet Burner.

	Natural Draft, 4.75 hrs.	Forced Draft, 4 hrs.
Steam pressure, lbs. per sq. in.	143	140
Oil pressure, lbs. per sq. in.	144	144
Feed water temperature, deg. F.	139	135
Oil temperature, deg. F.	231	223
Stack draft, inches	⅜	⅜
Air pressure in duct, inches	.....	5/16
Total water evaporated, lbs.	66,300	57,580
Pounds of water evaporated, per hr.	13,958	14,395
Total oil consumption, lbs.	5,035	4,315
Oil consumption, per hr., lbs.	1,060	1,079
Water evap. per 1 sq. ft. H.S. per hr.	8.418	8.682
Oil consumed, per sq. ft. of H.S. per hr.	0.639	0.65
Pounds of water per lb. of oil per hr., actual evaporation	13.16	13.34
Pounds of water evaporated per lb. of oil per hr. from and at 212 deg. F.	**14.76**	**15.03**
oil per hr. from and at 212 deg. F.	14.76	15.03

Increased evaporation, forced over natural draft, 3.13 per cent.
Increased oil economy, forced over natural draft, 1.83 per cent.

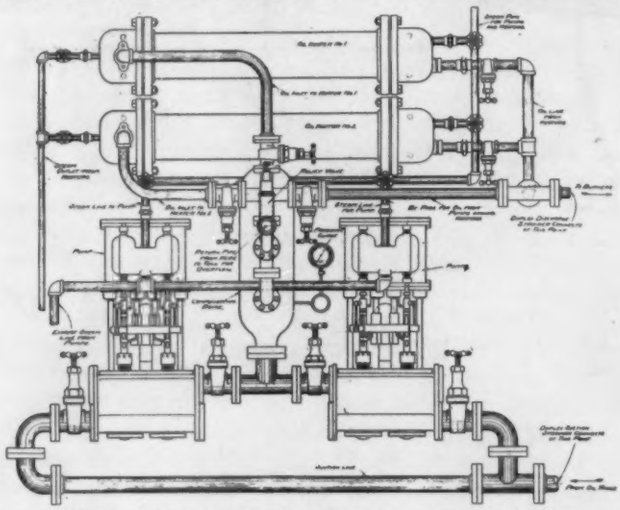


Fig. 93. Fuel Oil Pumping, Heating and Regulating System.

Fig. 92 illustrates the Tate-Jones pressure jet burner and furnace front. The oil is fed to the burner at 125 to 200 lb. pressure, and passes through tangential slots in the burner tip, where it attains a high velocity of rotation in the vortex chamber, and escapes through the opening in the end of the burner as a fine mist in the shape of a hollow cone.

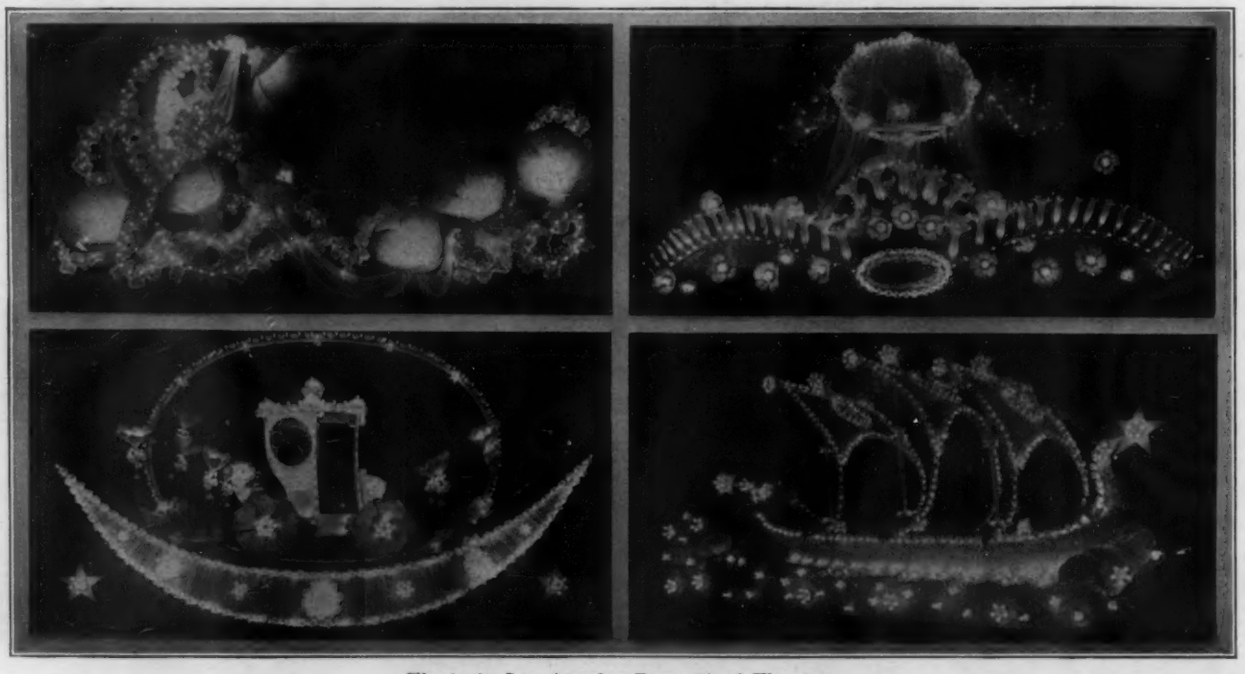
The amount of air needed for combustion is regulated by the damper on the air cone of the furnace front. The range of regulation is sufficient to make it adaptable for either natural or force draft. Inside the air cone are fixed the air impellers or blades, which give a rotary or whirling motion to the entering air. This whirling motion mixes the entering air with the oil mist much better than when the air enters in straight lines. Fig 93 illustrates the fuel oil pumping, heating and regulating system, which is in duplicate throughout.

THE LOS ANGELES PAGEANT OF FLOWERS.

The feast of flowers was elaborately staged at Los Angeles on May 8th by an electrical pageant which should go down into history as one of the most beautiful applications of electricity to art ever made. From the snow-drops and crocuses of early spring to the late sunflowers of autumn the floral year was reproduced in a series of fifteen electrical floats.

"America" was the first float in the procession. It depicted "Columbia" sitting on a glowing throne, surrounded by girls from our island possessions, and surmounted by an eagle. Then came "California," represented by brilliant poppies, "Queen Flora," a wealth of colored light, and "A Native Son," a bear with twinkling eyes of light.

These in turn were followed by beautiful symbolizations in light of the snow-drop and crosus, the tulip, bluebell, rose, peony, sunflower, hollyhock, violet, hybiscus, water lily and forget-me-not. Each float was fitted with from 1000 to 1200 lamps, arranged to give the diversified effects of splashing fountains, floating clouds, running water and flying birds. The entire pageant was the handiwork of Fawcett Robinson, and represented a $30,000 contribution from the Los Angeles 1915 General Committee.



Floats in Los Angeles Pageant of Flowers.

LOS ANGELES TO NEW YORK BY TELEPHONE.

During the past month the American Telephone & Telegraph Company extended its transcontinental line to Los Angeles, and on May 8th telephonic conversation was held for the first time, being made the occasion for a formal celebration at New York and Los Angeles. The accompanying picture illustrates the scene at Los Angeles, where many prominent men were present as participants and guests. Receivers were provided so that everyone present could listen to the conversation.

The transcontinental line enters thirteen states—California, Nevada, Utah, Wyoming, Colorado, Nebraska, Iowa, Illinois, Indiana, Ohio, Pennsylvania, New Jersey and New York, and the route by cities is as follows:

Los Angeles to San Francisco.....475 miles
San Francisco to Salt Lake City.....770 miles
Salt Lake City to Denver.....580 miles
Denver to Omaha.....585 miles
Omaha to Chicago.....500 miles

At Chicago the line branches, one wire going to Pittsburgh, 545 miles, thence to New York, 390 miles, the other going to Buffalo, 605 miles, thence to New York, 350 miles.

The joint rate for telephone traffic via transcontinental line, Los Angeles to New York, is $22.20 for the first three minutes, and $7.10 for each additional minute or fraction thereof. Arrangements are being made to extend the transcontinental service to other points in Southern California as rapidly as possible.

Among the electrical and financial men present were: H. E. Huntington, J. B. Miller, J. A. Lighthipe, Paul Shoup, W. G. Kerckhoff, A. B. Cass, W. B. Cline, William Baurhyte, C. S. Vance, C .R. Davis, Howard Huntington, W. A. Brackenridge, A. C. Bradley, Arthur Wright, Fred Leggett, T. E. Burger, H. A. Baree and C. F. Mason.

DECREASED BUSINESS OF WASHINGTON UTILITIES.

Reports filed with the Washington tax commission by the Puget Sound Traction, Light & Power Company, the Puget Sound Electric Company, the Tacoma Railway & Power Company, and the Northwest Traction Company, show that both the aggregate net income of the four concerns and the operating expenses decreased slightly during the fiscal year of 1914 as compared to the fiscal year of 1913, and that the operating expenses are also reduced in comparison with the year 1912. The aggregate net incomes and operating expenses for the three years of the four companies are as follows:

	1912.	1913.	1914.
Net income	$4,497,130	$4,815,982	$4,769,288
Operating expenses	3,389,920	3,423,615	3,329,353

These incomes and operating expenses were comprised of the following, by companies:

	1912.	1913.	1914.
P. S. T., L. & P. Co.—			
Net income	$3,252,589	$3,746,127	$3,899,829
Operating expense	2,117,727	2,075,599	2,012,605
Tacoma Railway & Power Company—			
Net income	359,343	367,661	285,323
Operating expense	731,503	743,138	725,340
Puget Sound Electric—			.....
Net income	413,178	385,703	301,285
Operating expense	383,966	389,663	359,617
Pacific Northwest Traction Co.—			
Net income	194,060	316,491	282,791
Operating expense	156,724	215,206	231,153

The reports show that neither the Tacoma Railway & Power Company, nor the Puget Sound Electric Company, was able to pay dividends any one of the three last years, either on common or preferred stock. The other companies paid dividends ranging from 1 per cent to 6 per cent.

Electrolytic insulation of aluminum wire is accomplished by depositing on the wire a thin coat of alumina from a sodium silicate solution. The di-electric strength of the flexible film thus formed is from 200 to 500 volts.

Los Angeles End of Transcontinental Telephony Trial.

JOURNAL OF ELECTRICITY
POWER AND GAS

FOUNDED 1887

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Change of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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Meeting Unfair Competition

The British Columbia Electric Railway Company is trying a novel experiment on its Vancouver and Victoria traction lines in order to meet the conditions caused by the European war and the competition of the jitney bus. Rather than reduce expenses by cutting down the excellent service which has always been maintained by this company, it was decided to increase travel by lowering the fare. To this end a special non-transfer ticket is sold at the rate of eight for twenty-five cents.

As this plan was not put into execution until May 10, it is as yet too soon to estimate the effect, though more tickets were sold on the first day than had been anticipated. This large sale was not left to chance or normal demand, but was stimulated by an extensive advertising campaign well calculated to increase the popularity of the tickets.

Incidentally this campaign carried the message as to the unfairness of the jitney bus competition. By thus going directly to the public, frankly explaining the situation and asking for the loyal support of their patrons, the company has accomplished more satisfactory and lasting results than could have been encompassed by regulation legislation from city and state bodies. The company took "no part in fostering an antagonism to the jitney, believing that the common sense of the citizens and the authorities will sooner or later result in the enforcement of adequate regulations."

The argument of greater traffic as a result of lower rates has been proven in the case of telegraph and telephone companies. By thus increasing the load factor and keeping the entire system in operation the unit cost is reduced. Furthermore, in this instance, its success will remove the necessity of laying off a large number of employes who would add to the distress already occasioned by non-employment. The experiment is one which should be watched by all traction companies as a possible solution of their difficulties without the extreme necessity of instituting a system of zone fares.

Electric Sign Progress

The character of any town can usually be better judged by its appearance after dark than by careful daylight inspection. This statement refers not only to the general illumination of the streets as exemplifying the progressiveness and civic pride of the people, but also to the number and kind of signs used for advertising purposes, as indicating the alertness of the merchants.

The past few years have seen a great advance in electric signs. Instead of the old panels of opalescent glass or perforated metal, dimly lighted from within by a carbon lamp, there are now marvelous talking and spectacular signs which are more effective sales agents than the clerks behind the counters. Whirling

wheels, flaring flames and shooting stars are used to attract attention, changing words and sentences to induce interest and persuasive display to develop desire for almost all articles of common consumption. The abundance of light is in itself attractive and a constant stimulant to trade.

This progress has been made possible not so much by the many ingenious flashers and novelties as by the development of the high efficiency incandescent lamp and the reduction in rates for electric current. Sign lighting seems to be following close in the wake of street lighting. In each case the single unit has been replaced by outline lighting, which in turn now bids fair to be thrust aside by flood lighting.

This latest development was first carried out on a large scale at the Panama-Pacific Exposition, whose beautiful color tones and shrubbery shadows have been harmoniously accentuated by masked lighting. A soft, subdued light is frequently more persuasive than strong glare. Incidentally, with high power lamps this innovation is more economical.

Other novelties are being produced from time to time. In its exhibit at the San Francisco exposition the U. S. Bureau of Standards shows neon and helium tubes twisted into the form of letters and words which give a pleasing and effective display, especially as a frequent flash is created in the helium tube without outside control apparatus simply by make and break of the vapor connection. The commercial applicability of this scientific curiosity has not been investigated, but there is little doubt concerning the ultimate use of this and many other novel effects in teaching people by the sign language.

Labor Famine Unlikely

If it were not for the past business stagnation in our nation—and every evidence is available to show that it has been passed—America would now be suffering from an insufficient supply of labor. The European war has caused two-thirds of the normal number of immigrants to remain at home as food for powder or to take the places of those so devoured. Thousands of foreigners have also responded to the call to arms and left this country to return to their native land. Many passengers on the ill-fated Lusitania, for example. were Britons bound for the scenes of war. Consequently any sudden constructional activity would find us hampered by a lack of unskilled labor.

Whether this possible labor stringency will be relieved or heightened by the ultimate cessation of European hostilities is a question which should be studied by those public utilities which apparently consider that a lack of capital is the only present bar to new constructions and extensions. The war has prevented the anticipated influx of immigrants which the Panama Canal was expected to bring to the Pacific Coast and many believe that Europe will need all the remaining population to rehabilitate the country from the devastations of war.

Yet a slight change in the angle from which this question is viewed presents an entirely different phase. Europe has lost many of its attractions. Despoiled homes and fields are not as easy to rebuild as to emigrate to the new land of promise and there make a new start; home ties have frequently been broken, and the taxes on meager incomes will be unbearably high in order to pay principal and interest on the colossal public debt which the war has augmented. To such a people the latent resources and peaceful surroundings of the Pacific Coast of North America will offer a most welcome haven. Coupled with this fact the ready access afforded to these desirable conditions by the Panama Canal leads to the conclusion that there will be no labor scarcity when the work of new construction is again started.

This new immigration will do much to solve the problem of capital required for new work. It has been truly said that the problem of modern industry is not the distribution of the money supply but the distribution of the man supply. "Money follows men." The opening of the New York stock exchange did not precipitate any large selling of American securities by European investors, as had been feared. In fact America is today one of the safest investment propositions in the world.

While Americans have no desire to profit from the misfortunes of their European cousins, the so-called "war business" already placed will yield a profit of at least $300,000,000, which is just equal to the amount that America owed Europe prior to last August.

The crop forecast is most reassuring, general trade is slowly improving, and every indication points that the entire country is on the verge of a new period of prosperity. The records of the past show that periods of industrial depression and expansion alternate in almost as regular succession as do the negative and positive stages of an alternating electric current. The business wave closely parallels the sine curve. The lowest point has evidently been reached and passed and this country is now about to enjoy an era of unprecedented prosperity. There is ample justification for immediate obedience to such slogans as "buy it now," and "advertise it now," as future events will soon to prove.

Because of the nature of their business, that of supplying public necessities, the earnings of the public service companies have been affected less by the industrial depression than other corporations. The Pacific Gas & Electric Company has resumed its dividends and other companies will undoubtedly do likewise. With new people to serve and new capital for extensions, there is every reason for most optimistic outlook in the West.

PERSONALS

A. P Bradley, of the C W. Hunt Company, Chicago, Ill., is at San Francisco.

C. V. Schneider, electrical contractor at Sacramento, recently spent several days at San Francisco.

Fred Todd of the sales department of the Pacific States Electric Company, Portland, Ore., is at San Francisco.

W. P. Geary recently succeeded **H. H. Sanborn**, resigned, as rate expert of the Railroad Commission of California.

W. L. Goodwin, vice-president Pacific States Electric Company, San Francisco, is on a business trip to Los Angeles.

G. H. Deike, representing the Mines Safety Appliance Company of Pittsburgh, Pa., is a recent arrival at San Francisco.

W. F. Minor, sales manager of the Holophane Works of the General Electric Company, Cleveland, Ohio., is at San Francisco.

W. Brewster Hall, Pacific Coast representative for Pass & Seymour, San Francisco, is on a business trip to Portland and Seattle.

W. C. Wurfel, Pacific Coast manager Westinghouse Lamp Company, has returned to San Francisco from Portland and the northwest.

W. S. Berry, sales manager of the Western Electric Company, San Francisco, Cal., left the first of the week for southern California.

H. V. Carter, president Pacific States Electric Company, San Francisco, returned Monday after a business trip to Portland and Seattle.

A. C. Hastings Jr., vice-president and secretary of the Mt. Konocti Light & Power Company, Lakeport, Cal., spent the week at San Francisco.

H. R. Noack, president of Pierson, Roeding & Company, San Francisco, has just returned from a ten days' business trip throughout Northern California.

A. F. Flanagan, vice-president of the Electric Engineering & Supply Company, Stockton, Cal., spent a few days during the week at San Francisco.

L. A. Lundstrum of the construction department H. W. Johns-Manville Company, San Francisco, returned after a business trip through the San Joaquin Valley.

T. W. Simpson, formerly in charge of the Federal Sign System (Electric) at Chicago, has been appointed Western manager, with headquarters at San Francisco.

H. F. Yost, of the sales department of the Electric Railway & Manufacturers' Supply Company, San Francisco, left the first of the week for a trip through Nevada.

Newman H. Holland, staff engineer for the Edison Laboratory, Orange, New Jersey, is at San Francisco to install the first Edison Telescript which automatically records both sides of a telephone conversation.

James F. Lee of Hankow, China, a member of the Chinese Commission on Industrial Relations with the United States, and having the electrical industry as his particular field, was a recent arrival at San Francisco.

F. S. Hunting, general manager of the Fort Wayne Electric Works of the General Electric Company, Fort Wayne, Ind., and son, who have been spending some time at San Francisco, left this week for Portland, Seattle and the Northwest.

Herbert L. Harries, formerly assistant general manager of the Louisville Gas & Electric Company, has succeeded **H. G. Fleischhauer**, resigned, as general manager of the Washington-Oregon Corporation, with headquarters at Vancouver, Wash.

C. E. Groesbeck, general manager of the Utah Power & Light Company, has returned to Salt Lake, bringing an approved budget carrying appropriations of approximately $1,000,000, after a month spent in New York in conference with the heads of his company. Mr. Groesbeck said that practically no new or development work would be started by the company this year, but that the money would be spent in rebuilding portions of the present system and completing work now under way. He is most optimistic over the business outlook, and said that men in the Eastern financial centers expect to see an era of prosperity in the country this year as has not been seen for years.

C. E. Lesher, associate geologist of the land-classification board of the United States Geological Survey, has been assigned by the Director of the Survey to take charge of the work of compiling the statistics of coal production published in the annual volume "Mineral Resources." This work has heretofore been directly under Edward W. Parker, whose resignation from the Geological Survey is effective July 1st. Mr. Lesher is a graduate of the Colorado School of Mines and after his graduation was engaged in mining in British Columbia until 1910, when he came to the United States Geological Survey. Since then as a field geologist he has had experience in the coal fields of Montana, Colorado, Wyoming, North Dakota, Washington and Oregon. As a member of the land-classification board of the Survey, his largest contribution has been in perfecting the scheme for the valuation of the public coal lands, in which it has been necessary to utilize a large amount of statistical data of various types. Mr. Lesher will continue his services as a member of the land-classification board, although the reorganization of that work will relieve him of the greater part of his duties in connection with coal-land valuation.

MEETING NOTICES.

San Francisco Section A. I. E. E.

The regular monthly meeting of the San Francisco Section of the American Institute of Electrical Engineers will be held at 8 p. m., May 28th, at the Engineers' Club. Prof. V. Karapetoff will present a paper on "Elements of High Tension Insulator Design."

Los Angeles Section, A. I. E. E.

The regular monthly meeting of the Los Angeles Section of the American Institute of Electrical Engineers was held May 18th, when Geo. L. Hedges' paper on "Solenoid and Electro-Magnet Windings" was presented by F. W. Harris. After the discussion on this paper, R. G. Peebles, an American engineer, until recently in the service of the German government, talked on Germany and the war.

Portland Jovian League.

The regular weekly luncheon was held at the Hotel Benson, May 14th, at 11:30 a. m., when a buffet lunch was served. At 12:00 the meeting was adjourned to the National Theater, where the league had arranged a benefit show to raise funds for putting on the electrical parade during the Rose Festival. To the regular programme of motion pictures were added a dancing number with an electrical garden setting. The league will clear several hundred dollars from the benefit.

Electrical Development and Jovian League.

The May 12th meeting of the League was held at the Portola-Louvre Cafe, President Leggett presiding, nearly 100 members being present. Reports of committees were made and adopted. Attention was directed to the call for a meeting of all Jovians sent out by Tribune Collins for the succeeding day at lunch hour to consider matters and act upon suggestions for the preparation for Jovian night, (June 8th) on the Zone, during the National Electric Light Association convention week. The prize lunch drawing was then held, the winners being Messrs. Hooker, Youngholm, Squires, Orrick and Russell. The meeting was then turned over to Mr. H. B. Squires as chairman of the day, who introduced his speaker, District Attorney Chas. M. Fickert, who talked on crime, its development, prosecution and prevention.

Electrical Baseball.

In a hard-fought game on May 15th, the Alameda County Electrical Development League defeated the Electrical Development League of San Francisco by a score of 10 to 7. These same teams played a 10 inning tie game on May 1st. The score was as follows:

	R.	H.	E.		R.	H.	E.
Callahan, 2b.....	1	2	1	Flynn. c.	1	1	1
LaRue, cf	0	0	0	Dunbar, p.	0	0	0
Woodward, rf.....	2	1	0	Murdock, 1b.	1	2	0
Anderson, 1b.	2	2	1	Fitzsimmons, cf. ..	1	3	0
Tara, 3b.	1	1	0	Donahue, 3b	1	1	1
Gerkack, ss.	1	2	1	Herbert, lf.	1	1	0
Zanheiser, lf.	0	0	0	Jolimay, 2b	1	0	0
O'Donnell, c.	1	0	1	Sandefur, rf.	1	1	0
Walker, p.	2	1	0	O'Connell, ss.	0	0	1
Totals 10		9	4	Totals	7	9	3

Busch-Sulzer Bros. Diesel Engine Reception.

W. S. Heger, manager of Busch-Sulzer Bros.-Diesel Engine Company, of St. Louis, gave a reception to the Pacific Motor Yacht Club and other invited friends at their exhibit in the Palace of Machinery, P. P. I. E., Sunday afternoon, May 16th. Although the day was somewhat threatening about 150 were present, including many ladies. The honored guests were Commodore Charles S. Crocker, Vice-Commodore F. H. Kelly and Rear-Commodore Rudolph Taussig. Mr. Heger in a few bright remarks, among which he mentioned that although Mr. Taussig was secretary of the Panama-Pacific International Exposition Company, he was making his first visit to the Palace of Machinery, introduced Mr. H. S. Jones who gave a very instructive lecture accompanied by lantern slides on the use and manufacture of their Diesel engine. Following Mr. Jones, Mr. Taussig in a short address, complimented the Busch-Sulzer Company very highly by stating that it was just such little entertainments as this given by the exhibitors that would help the Exposition Company in making this one of the greatest educational centers the world has ever produced. Closing the lecture, cigars and confectionery were distributed and the party was then invited to an entertainment prepared by Mr. James Hawkins of the Standard Gas Engine Company, on the Zone.

The Jovian Electrical League of Southern California.

The luncheon meeting of the League held on May 12th, and attended by over 100 Jovians and their friends, was ably presided over by Chief Stentor Allen E. Morphy, in view of the absence of Tribune Harry Pieper. After the customary introduction of guests, and also customary fines for non-wearing of identification badges and other crimes against respectable Los Angeles Jovianism were imposed by the Tribune in charge, who himself was imposed upon by the charge that the fines were too heavy and it was voted that in the future no fine must exceed the sum of twenty-five cents. It was announced that the contractors' ball will be held on May 21st. The meeting was then turned over to the chairman of the day, R. B. Davis, who had provided a splendid musical entertainment, consisting of a baritone solo by Mr. Monty, selections by the Jovian Instrumental Trio, solo by Mr. Anson and a duet by Messrs. Monty and Anson, accompanied by the Jovian Trio and Dick Alter at the piano. The talk of the day was given by A. B. Nauert of the U. S. Steel Corporation, on "The Manufacture and Use of Steel Products." Mr. Nauert, who had recently completed the educational inspection trip, arranged by his corporation, gave a splendid description of the processes involved in the manufacture of steel, from the mine to the hair spring, as he termed it. How the open pit mining is carried on near Duluth, the mixing of it by the use of three sets of cars operating in three sections of the mine and hauling it to the Lake steamers. He explained the production of coke from bituminous coal. The by-products obtained in the making of coke, such as tar and ammonia, are now being sold at 85 cents per ton. Slag from the furnaces is used for the making of cement in very large quantities. The speaker explained the difference in the operation of Bessemer converters and open hearth furnaces. He also bestowed high praise on the welfare department of the corporation, looking after the safety and sanitation requirements and for which over three million dollars is expended yearly by the company. The books in the libraries are printed in seven languages and each plant has a complete hospital equipment. Mention was made of the $400,000 exhibit at the San Francisco exposition, showing the variety of products of the corporation, varying from limestone selling at 35 cents per ton to watch spring steel selling at $92,000 per ton.

"JOVIAN NIGHT ON THE ZONE."

San Francisco's Jovians are demonstrating that they are equal to their opportunities and then some, as was indicated by the enthusiastic meeting of May 18th at the Hof-Brau Cafe, attended by the most prominent Jovians of the Bay district, when plans were made for a Jovian night on the Zone, June 8th, during the N. E. L. A. convention. Oakland, recalling the memorable rejuvenation held two years ago, at which San Francisco responded in such large numbers, is preparing to reciprocate and to date reports that she already has ten teams, each provided with a "victim" which will participate in the big parade on the Zone. Reports from Los Angeles Jovians indicate that the live city of the Southwest will be represented in the parade by at least ten teams, and Sacramento and Stockton will each have a team representing them. Over forty teams are listed to date to participate. Messrs. Bibbins, Holobird, Sanderson and Hillis are arranging to provide a handsome prize for the best and most unique team in the parade. It is expected that several handsomely decorated electrical floats will be featured by a number of the teams.

All Jovians are requested to participate in the parade, and any Jovian who will organize a team and secure a candidate is eligible as a captain. All teams will appear in costume and the boys are striving to outdo each other in providing humorous situations, with their victims taking the stellar parts.

Storage battery trucks, chairs, velocipede and wheel chairs have been reserved for team use and the Zone Concessionaires Committee is co-operating by furnishing for the parade camels, giants, lilliputians and other attractions. The 101 Ranch Circus will conclude the procession, after which a rejuvenation will take place in Toyland ballroom.

The next meeting will take place at the Hof-Brau, Monday noon, May 24th, at which all Jovians are requested to attend.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The commission has issued a supplemental order approving an agreement between the Southern California Edison Company and the Los Angeles Trust & Savings Bank, Trustee, providing for the issue of $5,000,000 of five year six per cent debentures. The Southern California Edison Company has received the approval of the Commission for the issue and sale of $2,500,000 of these debentures at the present time.

The commission has issued a supplemental order authorizing the Marin County Electric Railways to begin the construction of one mile of line in the town of Mill Valley, Marin county. The line which the railway company proposes to construct, to be known as the "Throckmorton Avenue Line," will run from the Northwestern Pacific Railroad Depot toward the Cascades.

The commission has issued an order authorizing the San Francisco-Oakland Terminal Railways to execute a promissory note in the sum of $27,000, bearing interest at six per cent, and payable to the Central National Bank of Oakland. This note represents the balance due on a note of $65,000 made by the Oakland Traction Company on March 21, 1912.

INDUSTRIAL

CENTURY MOTOR EXPOSITION EXHIBIT.

In Machinery Palace, at the Panama-Pacific International Exposition on First Avenue, and facing Avenue C, the motto "They keep a-running" attracts the eye of the sight-seer. Century single-phase motors and fans are here shown; motors from 1-20th h.p. up to 30 h.p., and bracket, desk, oscillating and ceiling fans are included.

The man interested in things electrical will be more than pleased when examining this exhibit. For instance, a five-horsepower 1750 r.p.m. motor will have next to it a similar sized motor taken apart, thus affording every opportunity for inspection and study.

Century Motor Exposition Exhibit.

The vertical group is represented by a 1 h.p., 1750 r.p.m. and another of like size 3500 r.p.m.—the latter for direct coupling to a Spencer turbine vacuum machine.

A linotype motor illustrates the method of manufacture for this class of apparatus.

Sawing a quarter section out of a stock motor and placing the three-quarters on exhibition suggested a unique way of exposing the "works" to the public.

Century a.c. oscillating, desk and wall-bracket fans are also shown; they are what are generally known as the split-phase induction type—no moving wire is used in their construction. Century a.c. ventilating and ceiling fans complete the exhibit. All Century motors and fans are designed by and constructed under the supervision of a corps of engineers who have devoted many years exclusively to the design and manufacture of single-phase apparatus.

TRADE NOTES.

The Telephone Electric Equipment Company of San Francisco, has been appointed Hart & Hegeman agents for the H. T. Paiste line of electric fittings, cutouts, etc.

The board of public works at Seattle has awarded a contract for a steam boiler for the Lake Union steam plant to the Charles C. Moore & Company at an estimated cost of $18,175.

The Jefferson Glass Company, of Follansbee, W. Va., manufacturers of illuminating glassware, have established Pacific Coast headquarters in the Rialto building, San Francisco. Mr. Edwin B. Pike is the Pacific Coast representative.

The S. & N. Electric Co., 577 Market street, San Francisco, has recently entered the electric cooking field, specializing on the transforming partially or entirely of gas, gasoline and oil stoves to electric ranges, electric heating units being substituted for the gas or oil burners. The company also manufactures several types of small electric cooking stoves.

H. A. McClelland, Mercantile Trust Company of San Francisco and Pacific Gas & Electric Company have filed an application with the commission requesting that E. A. McClelland and Mercantile Trust Company be granted authority to convey and transfer to the Pacific Gas & Electric Company all their rights, titles and interests in the street railway line extending from what is commonly called "J Street Extension," owned by the Pacific Gas & Electric Company, to tract of land known as "Elmhurst," near the city of Sacramento.

NEW CATALOGUES.

Bulletins 48904 and 48905, just issued by the General Electric Company, are devoted to Electric Arc Welding and Arc Welding Apparatus. One illustrates and describes apparatus for Electric Arc Welding. The other takes up the general subject of Electric Arc Welding and describes the three processes by means of which welding may be done.

The Westinghouse Electric & Manufacturing Company has issued a number of interesting pamphlets, including "Ready by the Clock," which gives details of the Westinghouse electric range, Westinghouse Railway Lightning Protection," "Radiator Type Transformers for the New Haven System," and "The Show Window Calendar," the first of a series of suggestions on window dressing.

NEWS NOTES

FINANCIAL.

PORTLAND, ORE.—North Western Electric Company, Wilbur E. Coman, general manager, is completing arrangements for disposal of its latest bond issue to continue extensions into new territory.

UKIAH, CAL.—A jury of Mendocino county citizens returned a verdict in a condemnation suit brought in the Superior Court here by the Yolo Power & Water Company, to condemn a Lake county estate, fixing the value of the property at $112.50 an acre. This price is $32.50 an acre higher than that which was fixed by a Lake county jury in the only condemnation suit heretofore tried during the dispute. The property involved belcngs to Emma J. Tompkins, and is on the shore of Clear Lake in Big Valley district. It is almost adjacent to the Mariner estate, upon which a Lake county jury, some months ago, placed a value of $80 per acre. The Yolo Power & Water Company claimed that this figure was excessive, and in the condemnation suit against the Tompkins estate, a corporation, asked that the trial be transferred to the Mendocino court. The estate of Mrs. Tompkins contains 14.09 acres. The jury awarded her $1677, of which $50 is allowed for improvements and $50 for damages.

LINDSAY, CAL.—On May 12th, 300 stockholders of the Tulare County Power Company of Lindsay refused to accept the offer made by the Mt. Whitney Power & Electric Company of Visalia of nearly $600,000 for its plant and system. Of the total 3490 shares of stock, there were 3200 represented. J. J. Cairns of Lindsay presided at the meeting and A. W. Shamel of Exeter acted as secretary. The vote to refuse the offer was on a basis of about 2600 shares against, to 400 for. Patrick M. Longan, representing 98 per cent of the stock of the Mt. Whitney Company, addressed the meeting and tendered an offer of $550,000, which with certain allowances made to the Tulare Power Company in the way of obligations, and other considerations, brought the total offer close to $600,000. It was figured out that the total liabilities of the Tulare Power Company were about $330,000. Following the offer made by Mr. Longan, several of the stockholders took part in a lively discussion. It developed during discussion that the plan of sale was for holders of preferred stock to receive $120 per share, and the holders of the common stock were to receive nothing, in consequence of the fact that they had received service without cost. This was the hitch that prevented the carrying out of the sale, as holders of common stock almost to a man voted against the proposal to sell. It is understood that nearly all consumers are holders of common stock. Following the talk by Mr. Longan for the Mt. Whitney Company, J. J. Henry, representing Liggett, Hichborn & Company, brokers of stockholders, offered to loan the company $300,000. $300,000.

BOISE, IDAHO.—G. M. Dahl of New York, vice-president of the Electric Bond & Share Company, and president of the National Securities Corporation, told the Idaho Public Utilities Commission April 26th of the plans that have been laid and the steps that have been taken toward the formation of a power merger to include the five companies now operating in Southern Idaho. He said the merger would be organized with a capitalization of $15,000,000. The Idaho-Oregon Light & Power Company, the Idaho Railway Light & Power Company, and its subsidiary, the Idaho Power & Light Company, have already been practically acquired by the National Securities Corporation, which is the holding company to hold the securities. The object of the hearing was to obtain information regarding the merger and determine whether it would be in violation of the state anti-trust law. The governor directed the attorney-general to make an investigation. He in turn authorized the utilities commission to conduct an examination, with Captain Davis as counsel. The hearing lasted but a few hours. The Great Shoshone & Twin Falls Water Power Company is now in the hands of a receiver. Mr. Dahl said negotiations are now pending between the bondholders of that company and the holding company whereby he anticipates that property will be acquired, though he did not think the holding company would bid directly at the receiver's sale. The stock of the Southern Idaho Water Power Company is now held by the American Waterworks & Electric Company. Mr. Dahl said negotiations similar to those being carried on with the Great Shoshone bondholders have been opened by the holding company and the stock and bondholders of the Southern Idaho Company. Asked what effort the merging of the various companies would have on rates, Mr. Dahl said so far as he could tell now the rates would be unchanged. Reminding his hearers that the rates would at all times be subject to regulation by the commission, Mr. Dahl went on to explain the purposes and hopes of the consolidation and to give his views as to competition as against what is generally called monopoly. "Modern thinkers in this field are agreed," said Mr. Dahl, "that the public utility business is a natural monopoly. I know of no case in which competition has proved to be of ultimate benefit to the public. Authorities on the question now advocate regulated monopoly as the plan on which such utilities should be operated to give the public the best service at the lowest ultimate rate. Under the competitive system a temporary reduction is usually given, but the advantage is never lasting. In bringing these various Idaho companies together we propose to so cut down the overhead expense so as to make it possible to put the business on a paying basis and still save the public money. It is by doing a large volume of business that the industry can be made to pay. This concern will be large enough so that it can afford to put into the field a corps of experts whose business will be to develop the volume of business, to find new uses for power and make conditions such that it will be put to more uses than it now is. The great problem in the hydro-electric business is to find a market. There is plenty of power here, but the market must be developed."

ILLUMINATION.

GILROY, CAL.—A special election will be held June 15th to submit the question of whether the city shall advertise for sale the electric light plant to the highest bidder.

LIVERMORE, CAL.—A resolution of intention has been adopted for the installation of electroliers on a number of streets, according to plans on file with the city clerk.

LOS ANGELES, CAL.—The city council has adopted an ordinance ordering the installation of an ornamental lighting system on Olive street, between Sixth and Pico streets.

BOISE, IDAHO.—Definite plans for obtaining a municipal light plant for Boise, resulted in the organization of a municipal ownership club of which A. Kool was elected president.

SANTA ANA, CAL.—The board of supervisors has let a contract to the Southern California Edison Company for furnishing electricity for street lights to be installed at El Modena.

LOS ANGELES, CAL.—The contract for improvement work in the Palms Lighting District has been awarded to the Southern California Electric Company by the board of supervisors.

DEER LODGE, MONT.—The contract for the installation of an electric light system has been awarded to C. W. Currah, Helena, for $4220.

LOS ANGELES, CAL.—The board of supervisors will receive up to June 1 sealed bids for installing and maintaining an addition to the system of street lighting in the Green Meadows Lighting District.

HOQUIAM, WASH.—A special election will be held June 7th, to adopt or reject an ordinance which will grant to George H. Tilden and associates, a franchise to construct and operate an electrical system in this city.

CORVALLIS, ORE.—W. W. Boner of Aberdeen, Wash., has presented a petition to the city council asking for a franchise to operate a gas manufacturing and distributing plant in Corvallis. A committee consisting of Dr. W. T. Johnson, chairman; B. B. Leedy and T. H. Cooper, has been appointed to investigate the proposition.

RIVERSIDE, CAL.—The city council has adopted a resolution to establish an east side lighting system. The resolution calls for the establishment of a system on Fifth, Sixth, Seventh, Eighth, Ninth and High streets, and on Pachappa, Park, Sedgwick, Comer, Eucalyptus, Franklin and Kansas avenues. The matter is now referred to the city engineer with instructions to file a report presenting plans, estimate of cost, etc.

PORTLAND, ORE.—Illumination of Fourth street from the Union depot to Jefferson street with electric cluster lights suspended from ornamental brackets is assured. The contracts signed by property owners provide for a light standard on each corner and at points 62½ feet apart along the curbs. The cost during a five-year period will be at the rate of $6.50 per month for each 100 feet of frontage for the electric current. Extension of Third street's arch lighting scheme from Burnside street to Glisan street, is under way and will be completed before the Rose Festival opens. It is probable the electric arches will be extended southward from Yamhill street to Market street soon.

TELEPHONE AND TELEGRAPH.

CHINOOK, MONT.—The telephone line to Bear Paw is being inspected with a view to being overhauled and repaired.

LOS BANOS, CAL.—Sealed bids will be received until June 21st for a franchise to erect telephone and telegraph wires in this city.

JULIAETTE, IDAHO.—Schupfer Bros. have purchased from R. H. Porter the Potlatch telephone line and will operate it. Improvements are contemplated.

LATON, CAL.—The board of trustees of the Laguna Reclamation District decided to proceed with the building of a standard telephone system 12½ miles in length.

FAIRBANKS, ALASKA.—A telephone line over the Coast-Fairbanks trail is a probability. The United States Signal Corps is making tests to demonstrate its practicability.

TUCSON, ARIZ.—The Mountain States Telephone Company has begun preliminary work of putting wires underground. It is expected the change will be completed in September.

DINUBA, CAL.—Sealed bids will be received until June 23d for the sale of a franchise to erect poles, wires, etc., for the transmission of electricity for telephone and telegraph purposes.

MARSHFIELD, ORE.—The movement of the big government wireless station at Cape Blanco to Coos Bay is reported as certain in accordance of the report of Geo. K. O'Hara from Mare Island.

BAKER, ORE.—The county court has issued an order grantng a franchise to the Medical Springs Telephone Company to operate from the boundary of Baker to Medical Springs and Keating.

BELLINGHAM, WASH.—J. J. Lynch, superintendent of construction for the Postal Telegraph Cable Company, has reached an agreement with the board of public works for a route over which the company's main line will enter the city.

LOS ANGELES, CAL.—The board of supervisors has adopted an ordinance granting the San Fernando Telephone & Telegraph Company the right to construct and maintain a telephone and telegraph system in the lands of the Porter Land & Water Company's subdivision No. 1.

BILLINGS, MONT.—The Farmers' Mutual Telephone Company has been incorporated by J. A. Beck, M. H. Mammen, C. H. Frey, et al., of Broadview, which is principal place of business; $15,00 capital stock. Lines are to be extended through Yellowstone, Stillwater and Musselshell counties.

WHITTIER, CAL.—Improvements aggregating $10,000 were begun by the Home Telephone Company in placing down town wires in an underground conduit and removing poles from eight blocks of the central business section. The first unit of work will include conduits for five blocks on Philadelphia street.

EUGENE, ORE.—Application has been made to the county court for a franchise to erect and maintain a rural telephone line on the road from Slayter's store at Blachley to Swiss Home, 25 miles, by the Lower Lake Creek Telephone Company. Hout & Eaton have applied for a franchise to construct a line a mile long on Pacific Highway south from Creswell.

TRANSMISSION.

RIALTO, CAL.—A station is being built by the Pacific Electric construction department to house a power plant.

SILVERSIDE, CAL.—The board of supervisors has granted Floyd Brown, a franchise to construct an electric transmission line through the town of Blythe.

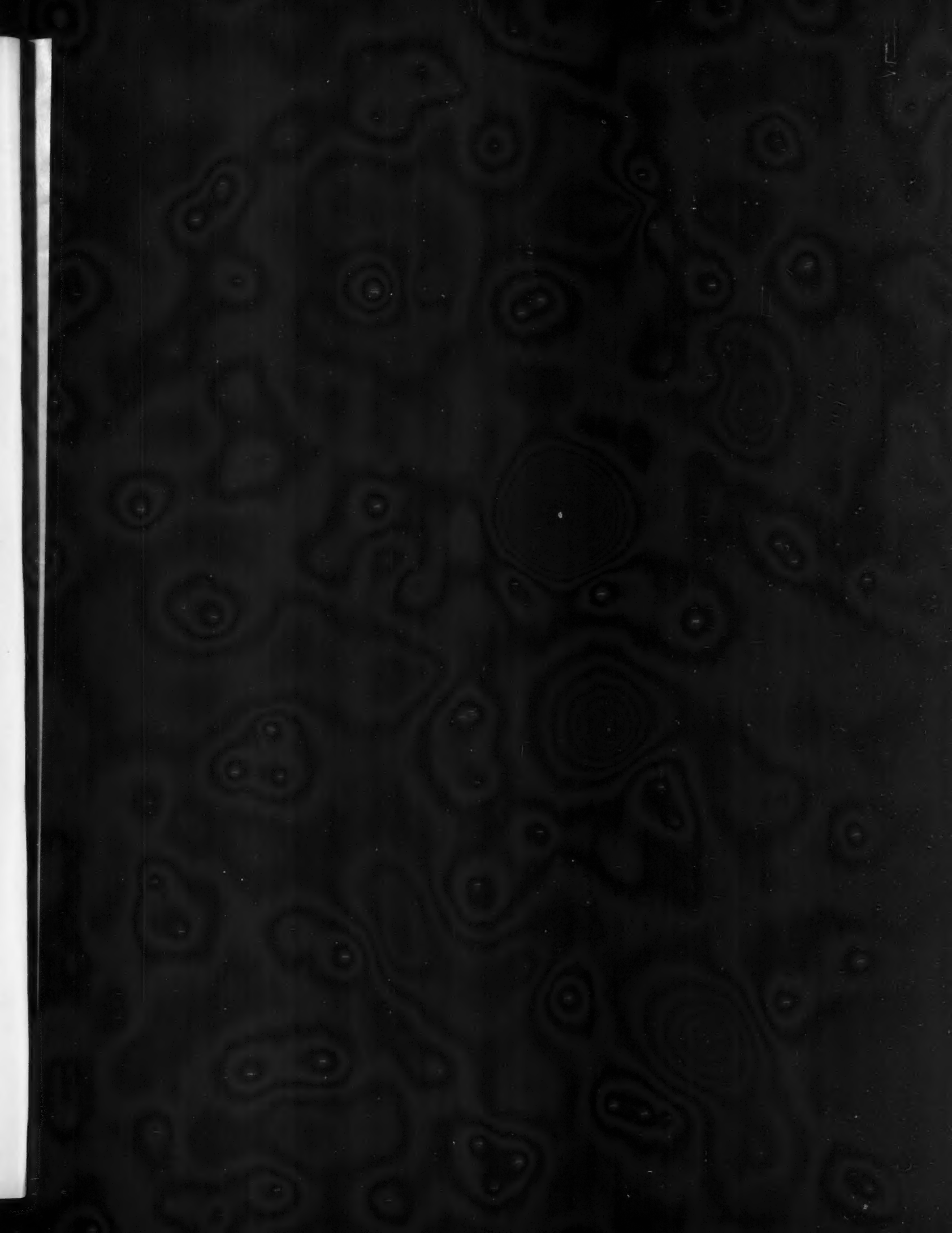
SPOKANE, WASH.—City Engineer Morton McCartney has prepared a final report of the engineering tests on two prospective power sites for the municipal lighting plant.

LOS ANGELES, CAL.—The public service commission has requested the city council to appropriate $100,000 to begin work on the Long Valley dam and power plant at Owens River gorge.

WENATCHEE, WASH.—The Chelan Electric Company has taken practically all preliminary steps toward the development of electric power on Lake Chelan. The company is closely affiliated with the Great Northern Railway. The proposed plant will furnish light and power for communities in central Washington. The Great Northern Railway is also likely to electrify its line in this direction.

WENATCHEE, WASH.—Another step toward the development of electric power on Lake Chelan was taken in the consummation of a deal involving the transfer of the M. E. Field hotel property at the head of Lake Chelan to the Chelan Electric Company. Permission was granted the Chelan Electric Company several years ago to raise the waters of the lake for the building of a dam and electric power plant.

WATERWORKS.

TEHAMA, CAL.—The board of trustees has passed an ordinance calling for a special election on May 11th to submit the question of incurring a bonded indebtedness in the sum of $10,000, for the construction of a water system.

LA GRANDE, ORE.—Preliminary surveys of the intake at Beaver Creek and surrounding country will be taken at once as an initial step towards the construction of a dam to supply added volume to the city's water plant. City Engineer L. D. Howland and Water Superintendent L. M. Hoyt will conduct this survey for the purpose of making applications to the government for the right to build the dam.